CENTRO STUDI BANCA E FINANZA

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CEFIN Working Papers

No 26

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April 2011

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Underpricing, wealth loss for pre-existing shareholders and the cost of going public: the role of private equity backing in Italian IPOs.

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ABSTRACT This study analyses the role of private equity investors in solving asymmetric information problems and the relationship to underpricing, wealth loss for pre-existing shareholders and the cost of going public. According to certification theory, companies backed by private equity investors are expected to have lower underpricing at the moment of an initial public offering, as they have fewer adverse selection problems, and there is less ex-ante uncertainty. However, the relationship between private equity backing and the cost of going public to issuers is less clear. We use a data set of 66 private equity-backed and 94 non-private equity-backed companies that went public on the Milan Stock Exchange between January 1998 and June 2008. Our findings provide evidence that out of the PE-backed firms, only those backed by private equity syndication show lower initial-day returns and indirect issuance opportunity cost, while there is no difference in the certification role between bank-related and non bank-related private equity investors. We also find that the benefits persist for IPOs backed by private equity syndication, although to a lesser extent, even after adjusting for direct costs (gross spreads) the opportunity cost of issuance.

Keywords: IPOs; underpricing; cost of going public; venture capital; private equity;
JEL Classification: G23; G24; G32; G34.

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1. Introduction

Asymmetric information problems concerning initial public offerings (IPOs) are widely documented in literature, and there is strong evidence that IPO prices jump substantially on the first day of trading, leaving a significant amount of money on the table. Underpricing is a robust phenomenon that extends across equity markets in several countries and time periods. In the early 1970s, several theories were developed and various empirical tests were carried out to explain the underpricing phenomenon. The best known underpricing explanations are asymmetric information-based models, such as Rock's (1986) winner's curse model, the ex-ante uncertainty theory developed by Ritter (1984) and Beatty and Ritter (1986), and the signalling model of Allen and Faulhaber (1989), Grinblatt and Hwang (1989) and Welch (1989).

Some authors (Barry *et al.*, 1990; Megginson and Weiss, 1991) have pointed out that a specific way to reduce information asymmetry is to have a private equity (PE) investor in the firm's ownership structure. They document that PE-backed companies are less underpriced when going public. PE investors are able to reduce adverse selection problems for IPOs by signalling the quality of the firms. In fact, they continually bring companies to market and can thus establish a reputation, which can be exploited in the pricing of IPOs. Following these preliminary studies, others tested the certification hypothesis across markets and time periods, with mixed results (Lin and Smith, 1998; Smart and Zutter, 2000; Francis and Hasan, 2001; Schertler, 2002; Franzke, 2003; Coakley *et al.*, 2009).

Another group of researchers cast doubt on the certification role of PE investors and developed alternative theoretical models, such as the "grandstanding theory" (Gompers, 1996; Lee and Wahal, 2004) and the "conflict of interest theory" (Gompers and Lerner, 1999; Hamao *et al.*, 2000). The lack of shared results highlights the limitation of studies concentrating purely on the presence or absence of PE backing. Several researchers have therefore distinguished between different types of PE investors: public, bank-dependent, independent and corporate (Tykvovà and Walz, 2007), bank-related and non-bank related (Dolvin *et al.*, 2007), of higher and lower quality (Krishnan and Singh, 2005; Dolvin and Pyles, 2006; Dolvin and Jordan, 2008), syndicated and individual (Tian, 2009). The findings of these studies suggest that not all PE-backed companies are affected equally by asymmetric information problems and, consequently, by IPO underpricing.

To underline the originality of our paper, we make some additional considerations about previous studies on PE-backed IPOs.

Firstly, the majority of the research analyses venture capital (VC)-backed companies, i.e., companies that have received VC funding at some stage before going public, as start-up, development or expansion capital. According to the internationally accepted definition (AIFI and PriceWaterHouseCoopers, 2006; Cumming and Johan, 2009), VC financing is part of PE activity, which also includes buy-out investments. Among the PE-backed firms, the VC-backed firms are smaller and younger, with a high expected growth rate and are therefore more difficult to evaluate. This problem should increase the effectiveness of certification services. In this paper, we look at PE-backed firms, which, including older companies with a longer operating history, are less likely to suffer from conventional information asymmetry problems. Thus, we document the existence of benefits associated with the presence of institutional investors and provide strong evidence in favour of certification theory.

Secondly, much of the empirical evidence in this ongoing debate revolves around differences in the degree of underpricing, omitting analysis of the opportunity cost of going public to the issuing firm and the wealth loss for pre-existent shareholders. In a typical IPO, issuing new shares constitutes a small fraction of total outstanding shares. Therefore, pre-existing shareholders who do not sell in the IPO suffer a dilution in value below the level of the underpricing. In addition, Barry (1989) explains that first-day returns inappropriately measure the indirect cost of going public, particularly when the number of shares retained by pre-existing owners is high, as often happens in the case of VC-backed firms. Habib and Ljungqvist (2001) and Bradley and Jordan (2002) further address this

question, proposing that high levels of share retention reduce the opportunity cost of issuance because fewer shares are being placed at a discounted price. Dolvin and Pyles (2006) and Dolvin and Jordan (2008) quantify the opportunity cost of issuance (OCI) to the listing firms, finding that companies backed by VCs, particularly of a higher quality, are negatively related to the OCI. In their measurement of the OCI, they do not consider the direct cost of going public or the gross spreads. As some studies indicate a negative correlation between underpricing and gross spread (Habib and Ljungqvist, 2001; Chahine, 2004), we consider it opportune to fill this gap.

Thirdly, the studies mainly focus on a specific market, such as the U.S. (Barry *et al.*, 1989; Megginson and Weiss, 1990; Lin and Smith, 1998; Li and Masulis, 2005), Germany (Kraus, 2002; Schertler, 2002; and Franzke, 2003) or the U.K. (Levis, 2007; Coakley *et al.*, 2009). As far as we know, there is no study on underpricing and the cost of going public for Italian PE-backed IPOs. In our opinion, an analysis of the Italian market is of special interest for two main reasons.

1) Bank-based PE investors assume greater importance in the Italian market than in the Anglo-Saxon markets. This point is critical if one considers that previous studies on bank-oriented systems have found weak evidence to support certification theory. Tykovà and Walz (2007), studying the German market, have hypothesised that bank-based PE investors are not good certification agents because they are typically bridge investors and have to be oriented toward the short term. Hamao *et al*. (2000) find that Japanese IPO firms backed by VCs whose parent is the lead underwriter do not have lower first-day returns because investors may require more underpricing to compensate for the potential conflict of interest.

2) The industrial structure is special because family businesses represent the majority of firms. Thus, the PE investor role is often confined to accompanying the firm to listing.

Consequently, this paper contributes to extending the existing literature by addressing two main issues.

First, we stress the role of PE certification in Italy by analysing whether or not all PE investors are alike in how they perform the certification function. We discriminate between individual and syndicated PE investors and between bank-based and non-bank-based PE investors.

Second, we examine whether the PE certification role reduces the OCI when it is measure net of gross spreads[1].

Our findings validate Megginson and Weiss's certification theory for the Italian market only in IPOs backed by a syndication of PE investors. The effects of the role of PE investors are positive for shareholders who sell shares in the IPO (first of all the PE investor itself) and for the pre-existing shareholders, whose stake undergoes a smaller loss than that suffered by shareholders of non-PE-backed firms. When we measure the loss of wealth suffered by pre-existing shareholders, adjusting the OCI for direct costs (gross spreads), the differences between syndicated PE-backed IPOs and other PE-backed IPOs shrink due to the higher gross spreads that mark the former; however, the differences remain statistically significant.

Finally, we find that there is no significant difference between the certification effect of bank-related and non-bank-related PE investors. However, when we compare bank-related and non-bank-related PE syndication, we discover that the certification role is confined to the first operators, who presumably enjoy a better reputation. Therefore, we suppose that the relationship between the presence of a bank-related PE investor and the costs of going public may depend on the type of PE support ("bridge financing" when they invest alone, "expansion and development capital" when they co-invest with other PE operators).

The remainder of the paper is organised into the following sections: Section 2 presents recent literature about IPO underpricing and the cost of going public to issuers, underlining the role of PE in reducing underpricing and costs. Section 3 contains a description of data, sample construction procedures and the methodological approach, while Section 4 describes the main results. Section 5 concludes the paper.

[1] We thank an anonymous referee for this suggestion.

2. Related literature

IPO literature has often focused on underpricing (i.e., the first-day initial return), defined as the spread between the initial offering price and the closing price at the first day of trading. Studies support the pervasiveness of underpricing across markets and across time periods. To explain the reasons that lead firms to go public at a discount price, economists have developed different theoretical models and conducted many empirical studies.

Baron and Holmstrom (1980) and Baron (1982) present a model of underpricing where issuers delegate the pricing decision to underwriters. They use their better knowledge of the market and investor demand to deliberately undervalue the IPOs in order to reduce marketing effort and favour their customers. Rock (1986) ascribes underpricing to the existence of information asymmetries between informed and uninformed investors. The former invest in information production and subscribe to IPOs only when they consider that the equilibrium price would be higher than the offer price. Uninformed investors are unable to discriminate between "good" and "bad" issues and may subscribe to all of the IPOs. Therefore, they are affected by a "winner's curse problem" and ask for a discount on the price so that they can accept the offer. Allen and Faulhaber (1989), Grinblatt and Hwang (1989) and Welch (1989) suggest that issuers deliberately cause underpricing to signal good quality. The signalling models assume that investors know that only the best firms can recoup the upfront cost of the underpricing signal from subsequent issues. One of the signals that the issuers can use to inform the outside investors about the quality of the IPO is the share retention ratio. A high retention ratio would indicate a higher quality of the firm, as the owners are reluctant to release a high proportion of future cash flows to outside investors. Among the above hypotheses, the ones based on the information asymmetry between issuers and investors have been the most influential. To provide some empirical evidence, Beatty and Ritter (1986) define "ex-ante uncertainty" as a proxy of information asymmetry, which in turn is related to some variables, such as the firm's age, size and type of assets.

If the underpricing is affected by the severity of the moral hazard problems between an investor and the firm's manager, the price discount may be reduced by the presence of a PE investor in the firm's ownership structure. Pioneering efforts in this literature have been made by Barry *et al.* (1990) and Megginson and Weiss (1991). Both studies, conducted on the U.S. market, find that the first-day returns of VC-backed IPOs are significantly lower than those of non-VC-backed IPOs. Although both studies present similar results, the authors' interpretations are different. Barry *et al*. (1990), analysing IPOs between 1978 and 1987, suggest that PE investors fund only a few firms because they are of better quality than non-VC backed firms. The screening and monitoring arrived at by institutional investors reduces ex-ante uncertainty and is recognised by capital markets through lower underpricing. Megginson and Weiss (1991) focus on the certification role of PE investors in IPOs between 1983 and 1987. Because they routinely bring firms to the public market, they can guarantee investors that the backed firms are not overvalued. They argue that retention of large equity stakes before and after the IPO is a bonding mechanism that increases the effectiveness of the VC investors' certification. After pioneering studies and to investigate the role of PE backing in IPO underpricing, the literature has moved along two main lines: some researchers have tested the certification hypothesis across markets and across time periods, while others have developed alternative theoretical models.

Studies that have extended the analysis to the PE investors' certification role in other markets and periods show mixed results. Lin and Smith (1998), using a sample of 2,634 U.S. IPOs between 1979 and 1990, find that the reputation of VC investors reduces the degree of underpricing, facilitating the workings of the capital markets. Lowry and Shu (2002) and Li and Masulis (2005) also find evidence supporting the certification hypothesis in the U.S. On the other hand, Francis and Hasan (2001) and Smart and Zutter (2005), who also analyse U.S. data, find that initial returns are positively related to VC backing.

Hamao *et al.* (2000) use a sample of 355 Japanese IPO firms between 1989 and 1994 to show higher underpricing for VC-backed IPOs, although once all of the determinants of underpricing are considered, VC-backed IPOs are less underpriced. Schertler (2002) analyses the determinants of underpricing firms that went public on the Nouveau Marché (71 firms) between 1996 and 2000 and on the Neuer Markt (256 firms) between 1997 and 2000. The evidence shows in both cases that PE backing *per se* does not affect underpricing. Franzke (2003) uses a comprehensive data set of 160 non-VC-backed, 79 VC-backed and 61 bridge-financed companies going public on Germany's Neuer Markt between 1997 and 2002 and finds that VC-backed IPOs are more underpriced than non-VC-backed IPOs. Similar results were reported by Kraus (2002) for an extensive sample of young firms floated on the German Neuer Markt between 1997 and 2001. Da Silva Rosa *et al.* (2006), using a data set of 333 industrial Australian IPOs filed between 1991 and 1999, find no statistically significant difference in the underpricing of VC-backed and non-VC backed IPOs. Levis (2007) investigates the first day initial return of a sample of 1,083 U.K. IPOs, consisting of three different groups: non-VC backed, VC-backed for early stage and development capital and VC-backed management buyout IPOs. The first IPO group shows higher underpricing than the other IPOs. Coakley *et al*. (2009) study the role of VCs and underwriters in relation to underpricing in the U.K. from 1985 to 2000. They provide support for the certification role of VCs in U.K. IPOs for the period 1985-1997. This role ceased during the bubble period (1998-2000). Klaassen and von Eije (2009) study a sample of 55 Dutch IPO firms between 1994 and 2005 and find that VCs had no significant effect on IPO underpricing.

[Insert table 1 about here]

The findings of studies for different markets, as summarised in Table 1, show that there is stronger evidence for the certification role of PE with respect to the bank-oriented systems (France, Germany and Japan) in the market-oriented financial system, mainly in the U.K. and U.S. . This evidence is probably attributable to different types of investors operating in different markets (independent in Anglo-Saxon markets, bank-based in Continental Europe and Japan).

Tykvovà and Walz (2007) highlight that independent VC-backed IPOs have lower underpricing than IPOs backed by captive VCs (bank-based and public VCs). Unlike bank-based and public VCs, who are usually only bridge investors, independent VCs are actively involved in the management of their portfolio companies and must be oriented toward the long-term. Thus, they are better able to resolve information asymmetries. However, Dolvin *et al.* (2007), analysing the U.S. market, find that indirect issuance costs are lower for IPOs with bank-related VC-backing. The banks may be valuable certification agents because they have access to inside information and are able to evaluate opaque information profitably.

These two papers are among the studies that extend the literature on the role of certification, questioning whether or not all PE investors are able to play the certification role with the same degree of effectiveness. From this viewpoint, Gompers (1996) and Neus and Walz (2002) find that the older the VCs, the less pronounced the expected underpricing phenomenon. Dolvin and Pyles (2006) focus on the quality of the lead VC investor, using similar measures to those applied in the studies on the underwriters' certification role. They conclude that there is a negative correlation between VC quality, the asymmetric information problem and underpricing. Tian (2009) shows that firms backed by a VC syndication are less underpriced than firms backed by single VCs, which signals superior information for the market. The idea is that the presence of two or more VC investors willing to co-invest in a single deal may communicate favourable private information to the capital markets, reducing the degree of asymmetric information. The results reported by Tian (2009) are supported by the finding that more reputable VCs are better able to attract other VC investors (Hochberg *et al.*, 2007).

Although the certification hypothesis is investigated the most frequently in analyses of the role of PE in IPO underpricing, some researchers have developed alternative theoretical models. Gompers (1996), for example, proposes a "grandstanding hypothesis": young VC firms bring companies to

the public earlier than older VC firms in an effort to establish their reputation and to raise capital for new funds. Similar results are found by Wang *et al*. (2003), Lee and Wahal (2004) and Sun and Fang (2008). Gompers and Lerner (1999), on the other hand, propose the "conflict of interest hypothesis", suggesting that VCs can amplify the information asymmetry between underwriters and outside investors if they are captive subsidiaries of, or otherwise affiliated with, the underwriting investment banks. In these cases, the underwriter can easily access private information about the issuing company and has an incentive to exploit this information at the expense of IPO investors. Following the direction of this study, several researchers have analysed the impact of prior equity ownership on the equity underwriting process by studying VC-backed IPOs where underwriters and VC investors are affiliated. Hamao *et al*. (2000) and Klein and Zoeller (2001) find evidence supporting the conflict of interest hypothesis in Japan and Germany. In contrast, Espenlaub *et al*. (1999) for the U.K. and Li and Masulis (2005) for the U.S. find lower underpricing for IPOs backed by VCs who are also underwriters. Ljungqvist (1999), using the data set of Megginson and Weiss (1991), demonstrates that the VC-backed IPOs appear less underpriced because the incentives of old shareholders to reduce underpricing are greater. He finds that VC-backed IPOs in the U.S. do not experience less underpricing once an assessment of true wealth loss to the entrepreneur is carried out.

All of the studies mentioned focus on the role played by PE in IPO underpricing. However, Habib and Ljungqvist (1998) argued that underpricing is not the issuers' primary concern. Companies and pre-existing shareholders (and their venture backers, if any) will only care about issue costs. In particular, Ljungqvist (2001) and Bradley and Jordan (2002) find a positive relationship between share overhang and underpricing, suggesting that owners who sell fewer shares suffer only marginally from underpricing. Consequently, an interesting issue remains to be addressed: are the PE investors able to reduce the loss of wealth for pre-existing shareholders and the cost of going public? The question is of interest, as PE-backed IPOs should suffer less from the effects of underpricing and have a lower proportion of share retention and a higher proportion of sold shares. Dolvin and Jordan (2008) quantify the OCI, that is, the money left on the table from pre-existing shareholder wealth, for a sample of U.S. listing firms, finding that VCs are associated with a lower OCI as a result of the certification effect. Dolvin and Pyles (2006) and Dolvin *et al.* (2007) find that firms backed by higher-quality VCs and bank-related VCs maintain a lower cost for going public. However, these studies focus on the indirect OCI without considering the direct listing costs, such as gross spreads. As some studies have shown a negative correlation between underpricing and gross spread (Habib and Ljungqvist, 2001; Chahine, 2004) and others reported a positive relationship between PE backing and gross spread (Zhang, 2007), we consider it important to fill this gap.

3. Data and methodology

Our sample consists of 160 IPOs by companies that went public on the Milan Stock Exchange between 1998 and 2008. To select the sample, we excluded IPOs filed by financial institutions, by companies that were already listed on other foreign stock exchanges and by firms with incomplete information about the offer and the aftermarket. Using the annual "AIFI VC-backed IPO market reports"[2], we divided the sample into two panels: PE-backed IPOs (66) and non-PE-backed (94). Of the PE-backed IPOs, 27 are filed by companies backed by PE syndication, i.e., by more than one institutional investor, while 38 are bank-affiliated PE-backed IPOs[3].

The data have been obtained from several sources. We collected data on the issuing characteristics from offerings prospectuses, while data on the demand for IPOs and oversubscription come from

[2] AIFI is the Italian Private Equity Investors Association.

[3] For firms backed by PE syndication, we identify the investor that provides the most funding as the lead PE investor and use this criterion to segment our sample.

the Milan Stock Exchange press releases; market prices were obtained from Datastream, while the issuer characteristics come from Aida Bureau Van Dijk.

Measuring IPO underpricing

In the literature, two main indicators are used to measure underpricing: simple underpricing and adjusted underpricing.

The first term is defined as the difference between the closing price at the first day of trading and the offering price, divided by the offering price:

$$U_1 = \frac{P_{i,1} - P_{i,0}}{P_{i,0}}$$

where $P_{i,1}$ is the closing price of company i at the end of the first trading date and $P_{i,0}$ is the offer price of company i. Adjusted underpricing also considers the market index return (in this analysis we use the Mib index) from the offer beginning (I_0) up to the first day of trading (I_1):

$$U_{1,Mib} = \frac{P_{i,1} - P_{i,0}}{P_{i,0}} - \frac{I_{i,1} - I_{i,0}}{I_{i,0}}$$

However, this indicator has some limitations: it ignores the correlation between security returns and market returns. A more accurate measure of underpricing can be obtained by weighting market index performance for the company's beta as follows:

$$U_{1,Mib,\beta} = \frac{P_{i,1} - P_{i,0}}{P_{i,0}} - \frac{I_{i,1} - I_{i,0}}{I_{i,0}} \beta_{i,Mib}$$

To calculate beta, we use the daily returns of the companies' stocks in our sample and the market index during the first year of listing. Beta-adjusted underpricing is based on two assumptions: 1) systematic risk does not change during the first year of listing; and 2) the market before listing and without official prices is able to measure the Beta.

The Opportunity Cost of Issuance

Following Dolvin and Jordan (2008), we measure the underlying OCI as the money left on the table relating to pre-existing equity value, which implies the following:

$$OCI = \left[\frac{N_0 (P_{i,1} - P_{i,0})}{N_0 P_{i,0}} \right] * \left[\frac{N_0 P_{i,0}}{P_{i,1} N_A - N_{0,p} P_{i,0}} \right];$$

where N_0 is the number of shares offered in the IPO, $N_{0,p}$ is the number of primary shares offered, N_A is the total number of shares after the offering and all other variables are as previously defined.

The first term is underpricing (i.e., money left on the table relative to the gross proceeds of the offer) and the second term is the offering size as a percentage of pre-existing shareholder wealth.

We also measure the OCI adjusted for the gross spread as follows[4]:

$$OCI_{\text{adjusted}} = \left[\frac{N_0 (P_{i,1} - P_{i,0}\delta)}{N_0 P_{i,0}\delta} \right] * \left[\frac{N_0 P_{i,0}\delta}{P_{i,1} N_A - N_{0,p} P_{i,o}\delta} \right];$$

where δ is equal to one minus the gross spread percentage and all other variables are as previously defined.

Determinants of IPO underpricing (and OCI)

[4] This formula is developed, but not tested, by Dolvin and Jordan (2008).

The first objective of this paper is to verify the validity of the certification theory for the Italian stock market and to find any differences in behaviour between the various types of PE operators. For this purpose, the beta market-adjusted underpricing is regressed in a linear multivariate model (Ordinary Least Regression) against several variables to test some of the proxies of information asymmetry and to highlight differences between PE-backed IPOs and other IPOs.

First, we considered "firm-specific" variables, such as the logarithm of the firm's age (Log_Age) and the logarithm of total assets (Log_Asset). Beatty and Ritter (1986) demonstrate that underpricing is higher for younger and smaller firms because of greater uncertainty about their value.

Second, we use "IPO-specific" variables, such as the logarithm of the total offer size (Log_Size), the proportion of shares retained by the pre-IPO owners (Share Retention), the fraction of shares offered in the IPO represented by secondary shares (Sell) and the percentage of shares reserved for institutional investors (Institutional Ratio). We expect that the issue size would have a negative effect on underpricing, according to Beatty and Ritter (1986) and Ibbotson *et al*. (1994). The effects of share retention on underpricing are three-fold, and we may not be able to predict whether they will be positive or negative. On the one hand, higher pre-IPO shareholder equity retention should signal higher quality for the post-IPO company, as in a moral hazard model, such as Jensen and Meckling's (1976) and in the adverse selection model, shown by Leland and Pyle (1977). On the other hand, higher share overhang will make underpricing less costly, reducing the issuer's incentive to contain it (Barry, 1989; Habib and Ljungqvist, 2001; Bradley and Jordan, 2002). Finally, when more shares are retained, the number of floating shares will be reduced, and underpricing will be required to improve liquidity (Zheng *et al*., 2002; Li *et al*., 2005). The larger the percentage of IPO secondary shares, the higher the expected incentive to reduce first-day initial returns (Habib and Ljungqvist, 2001; Ljungqvist and Wilhelm, 2003). As for the Institutional Ratio variable, Aggarwal *et al.* (2002) find that there is a positive relationship between institutional allocation and underpricing. If institutions have private information, the demand from institutions is greater in higher underpriced issues, and underwriters may allocate them a greater number of shares in these issues.

Third, we have taken into consideration the market conditions in which the offer is developed. As observed by Ibbotson and Jaffe (1975), the timing of an IPO is important in explaining its initial returns. Thus, our model includes the market index performance over the 100 days before the offering (Market Index) and the volatility of the market index over the 60 days prior to the offering (Market Volatility).

Fourth, our regression model includes some proxies for the IPO risk. One proxy is the after-market standard deviation (SD) of stock returns. Ritter (1984) noticed that the higher the volatility of an IPO's after-market return, the higher the initial returns. This risk proxy has been tested on various IPO markets: Johnson and Miller (1988), Jegadeesh *et al*. (1993), Chishty *et al*. (1996) in the U.S.; McGuinness (1992) in Hong Kong; Clarkson and Merkley (1994) in Canada; Wasserfallen and Wittleder (1994) in Germany; and Cassia *et al*. (2002) in Italy. In the present study, after-market volatility is defined as the SD of daily returns in the four trading days after the first day of trading ($SD_{4\text{-days}}$). Other proxies for risk are the dummy variables for the market segment: D_NM is set at 1 when the company is listed on the New Market[5]; D_EXP equals 1 when the company is listed on the Expandi Market[6]. The traditional explanation in IPO literature (Loughran and Ritter, 2004) assumes that the higher risk of high-tech IPOs increases underpricing. Moreover, the listing requirements for the New Market are softer compared to those for the main board (MTA) (Cassia *et al*., 2004). As shown by Johan (2010), when the listing standards are more stringent, the company going public can benefit from a signalling effect that reduces underpricing. Therefore, the expected sign of the D_NM is positive. We also expect the D_EXP to be positive because underpricing

[5] The New Market segment was introduced in 1999 to encourage the listing of high growth firms, mainly high tech firms, and was closed in 2005.

[6] The Expandi Market was set up in 2003 to facilitate the listing of small firms and was closed in 2009.

should be negatively related to firm size. Fifth, we include oversubscription in the model, i.e., the rationing of shares (demand in excess of supply) as the proxy for demand. We use the logarithm of oversubscription in the retail segment (Log_Oversub Retail), the logarithm of oversubscription in the institutional segment (Log_Oversub Inst) and a dummy variable (D_Oversub) that is set at 1 when institutional oversubscription is higher than retail oversubscription. Rock's winner curse model (1986) reports that both informed and uninformed investors apply for "good issues", while only uninformed investors apply for "bad issues". For this reason we expect a positive relationship between oversubscription (both institutional and retail) and underpricing. Moreover, we argue that the D_Oversub variable has a positive coefficient because we expect more underpricing if oversubscription from informed investors (institutional segment) is higher.
Finally, we consider two variables to capture the involvement of PE investors: the D_SPE, which is set at 1 when companies are backed by PE syndication and 0 otherwise, and the D_NSPE, which is set at 1 when companies are backed by single PE investors and 0 otherwise. According to Tian (2009), we believe that PE syndication in the ownership structure of firms increases the effectiveness of the certification role.
Thus, the base regression model (Model 1) is structured as follows:

$$\begin{aligned}\text{Dep} = \alpha_0 &+ \beta_1 \text{Log\_Age} + \beta_2 \text{Log\_Asset} + \beta_3 \text{Log\_Size} + \beta_4 \text{Share Retention} + \beta_5 \text{Sell} + \\ &\beta_6 \text{Institutional Ratio} + \beta_7 \text{Market Index} + \beta_8 \text{Market Volatility} + \beta_9 \text{SD}_{4\_\text{days}} + \beta_{10} \text{Log\_Oversub Retail}) + \\ &+ \beta_{11} \text{Log\_Oversub Inst} + \beta_{12} \text{D\_Oversub} + \beta_{13} \text{D\_NM} + \beta_{14} \text{D\_EXP} + \beta_{15} \text{D\_SPE} + \beta_{16} \text{D\_NSPE} + \varepsilon_i\end{aligned}$$

Additionally, we estimate another model (Model 2), replacing the D_SPE and D_NSPE variables with a dummy for bank-based PE investors (D_BPE) and another for non-bank-based (D_NBPE) investors. The expected results are not very clear because the literature has provided mixed results (Tykvovà and Walz, 2007; Dolvin *et al.*, 2007).
Finally, to assess whether the PE investors' certification role is able to reduce the opportunity cost of issuance and the overall cost of going public, we replace underpricing by the OCI and $\text{OCI}_{\text{adjusted}}$.
Previous studies find that the determinants of underpricing explain only a small part of the OCI. However, we expect that our broad set of variables may explain the variability of the opportunity cost of issuance quite well.

4. Empirical results

Descriptive statistics
Table 2 presents the business sector subdivision of the sample, based on the classification adopted by the Milan Stock Exchange.

[Insert table 2 about here]

It highlights some differences in business sector composition between PE-backed and non-PE-backed IPOs. A relatively larger number of non-PE-backed IPOs occurred in the "services" macrosector due to the large number of "public utilities". On the other hand, within the industrial sector, there are no major differences between the different types of IPOs.

[Insert table 3 about here]

Table 3 reports the sample IPO timeline. There are two periods in which the number of IPOs is significantly high: the first is between 1999 and 2001, the second refers to 2006-2007. This emphasis is firstly due to the bullish market momentum, according to the "hot issue market theory". The large number of IPOs filed in 1999-2001 (80 IPOs, 50 per cent of the total) is also attributable to the creation of the New Market, which aroused much interest among Italian new-tech companies. Additionally, the incidence of PE-backed IPOs and that of two sub-groups does not exhibit a trend or a specific connection with the two hot issue periods.
Table 4 presents some characteristics of the issuers (Panel A) and their offerings (Panel B) and provides data on underpricing (simple and beta adjusted), other costs of listing and the after-market SD of stock returns (Panel C).

[Insert table 4 about here]

There are no statistically significant differences in issuer characteristics between PE-backed firms and other firms. Interpretation of these data should be undertaken with consideration that in Italy, unlike other markets (i.e., the U.S. market), there is a weak link between operations carried out by VCs (mainly seed financing operations and start-up financing) and the IPOs.

Among the PE-backed firms, those in which bank-affiliated PE investors have invested are much older and larger than average, while the SPE-backed firms seem younger and smaller, although these differences are not significant.

The most notable distinction in offering characteristics is share retention. PE-backed firms place a significantly higher percentage of the share (37.41% versus 30.49%) through the IPO. Most of the differences are due to PE-backed issuers selling more old shares; in fact, the fraction of secondary shares involved is significantly greater among PE-backed firms (40.89% versus 32.07%). The data is consistent with the fact that PE-backed firms go public to enable institutional investors to liquidate a portion of their stakes. As for the other offering characteristics, PE-backed IPOs have a smaller offer size, although the difference is not significant. It should be noted that, contrary to Brav and Gompers (2003) and Dolvin (2005), we do not find that PE investors are associated with shorter lockup periods. The classification of PE-backed firms highlights that PE syndications are associated with lower share overhang (59.91% as opposed to 64.61% of single PE investors), probably because they enter firms with a larger share of capital.

Examination of the statistics relative to the costs of going public reveals that PE-backed IPOs are less underpriced (1.67% as opposed to 6.21%, using mean simple underpricing and 1.92% as opposed 6.57%, using mean beta-adjusted underpricing), show lower OCI (0.29% as opposed to 1.72%) and have higher gross spreads (4.15 per cent as opposed to 3.74%). Otherwise, the $OCI_{adjusted}$ is not significantly different for PE-backed and non-PE-backed issues (2.15% as opposed to 2.94%).

Within PE-backed IPOs, we observe that the firms in which PE syndications invest are associated with lower first-day returns (-1.48% using mean simple underpricing and -0.86% using mean beta-adjusted underpricing) and the OCI (-0.81%), while there are no significant differences in gross spread or the $OCI_{adjusted}$. Bank affiliation does not reveal any significant effect on after-market volatility, underpricing, or the cost of listing.

[Insert table 5 about here]

Table 5 summarises the results obtained by calculating beta-adjusted underpricing and the $OCI_{adjusted}$ over time. T-tests were conducted to determine the statistical significance of the mean values.

The mean underpricing for the whole sample equals 4.65%, while the mean $OCI_{adjusted}$ is 2.61%. The sample mean values are statistically different from zero and are highly significant (99%), but they do not appear to be regularly distributed over time. For some years, the results are not statistically significant, often because of the small number of firms going public. Analysis of the most recent IPOs reveals an increase in both underpricing and the $OCI_{adjusted}$, with mean values of almost 10% and around 4% in 2005 and 2006, respectively. Remarkably, the IPOs seem to be overpriced in some years (2001-2003 and 2008).

Focusing on the underpricing time series distribution, we make two observations. Firstly, IPO underpricing increases during "hot issue" periods according to a pioneering study (Ibbotson and Jaffe, 1975; Ritter, 1984). Yet, in the years when few companies went public (such as in 2002-2003 and 2008) the IPOs seem to be less underpriced. Secondly, PE-backed IPOs are less underpriced than non PE-backed IPOs, especially during the first hot issue period (1998-2000), which coincides with the listing of many high-tech companies.

Ordinary Least Square Regression Analysis

The results from the underpricing cross-sectional regression model are given in Table 6 (Columns 1 and 2).

[Insert table 6 about here]

With regard to "firm-specific" variables, the Log_Asset exhibits a significant coefficient with the sign predicted in the theory (-0.032), suggesting that a higher accounting value of total assets is associated with a lower initial return. Although the age of firms serves as a good risk proxy in numerous studies, the results presented here indicate that the Log_Age variable is insignificant. In addition, the "market-sentiment variables" (Market Index and Market Volatility) and the "IPO-specific" variables (Log_Size, Share Retention, Sell, Retail Size) are likewise insignificant. These results are consistent with those reported by Cassia *et al.* (2002). As for the ex-post risk proxy ($SD_{4\text{-}days}$), its positive correlation with the dependent variable (the coefficient is 1.731) reveals how a greater risk involves greater underpricing. In other words, the underwriters of the most hazardous IPOs have enjoyed a higher first-day initial return. They obtain, therefore, ex-post compensation for the high risk assumed. The Log_Oversub Retail and the Log_Oversub Institutional variables are positively related to the dependent variable, as in Rock's model (the coefficients are 0.056 and 0.057, respectively). Moreover, the high demand for securities on the primary market leads to excess demand on the first day of listing and therefore an increase in price. The D_Oversub assumes a positive coefficient (0.050) as we supposed: when the equilibrium price is significantly higher than the offer price, the informed investors' demand is higher than that of non-informed investors.

The dummy variables related to the market segment show mixed results. The D_NM is negatively related to the dependent variable (-0.074), revealing that companies going public in this segment are less underpriced. We can argue that the investors consider a listing on the New Market as a clear risk signal that the issuer gives to the market. In this way, the investors' perception of being exposed to moral hazard behaviour is reduced. The relationship between the D_EXP and underpricing is not significant.

Considering the variables of interest for this study, the coefficient estimate of the PE syndication dummy (D_SPE) in Column (1) is negative (-0.054) and significant (t = -2.431). Otherwise, the relationship between the single PE dummy (D_NSPE) and the dependent variable, although negative (-0.016), is not significant (t = -0.867). These findings are in agreement with the univariate sorts in Table 5 and indicate that the lower underpricing for PE-backed IPOs is due to the certification role of PE syndications.

As suggested in the theoretical explanation of the model, PE syndication increases the effectiveness of the certification role.

The estimated coefficients of the second regression (Column 2) suggest that there is no significant difference between the certification effect of bank-related (D_BPE) and non-bank-related PE investors (D_NBPE).

The two underpricing regression models have considerable explanatory power. The R^2 equals 51.3% for Model 1 and 50.4% for Model 2. Additionally, when we compare unreported results for bank-related and non-bank related PE syndication, we discover that only the former are able to contain underpricing. This result suggests two considerations.

1. The reputation of lead PE investors is relevant to solving asymmetric information problems. The bank-related PE investors, all things being equal, should have a better reputation, especially in a bank-oriented system, such as the Italian financial system.

2. When the banks are only bridge investors (typically when they invest directly in a firm and are single PE investors), the effect on underpricing is zero. Given the limited value of information focusing on underpricing, we assess the cost of issuing for share retention and deal with the OCI in Columns 3 and 4. As in previous studies, when we replace underpricing by the OCI, a smaller number of independent variables are significant, and explanatory power decreases. Our findings concerning the control variables indicate that firm size does not influence the OCI, as documented

by Dolvin and Jordan (2008), and that the variables that strongly affect underpricing, such as the after-market SD of stock returns, also influence the OCI. Notably, with reference to the variables of interest, the D_SPE shows a negative coefficient (-0.023), although it is lower than in the underpricing regression model.
In Columns 5 and 6, we replace the OCI with the $OCI_{adjusted}$ as the dependent variable and rerun the regressions.
Compared with the previous model, the share retention ratio exhibits a negative and significant coefficient, whereas the effect of the PE certification role decreases (the coefficient for the D_SPE variable equals -0.020) but remains significant. As noted in the univariate analysis and consistent with Zhang (2007), PE-backed firms pay higher average gross spreads. PE operators are particularly anxious to preserve their reputation and are therefore probably willing to pay a higher commission to reduce underpricing. It is remarkable that the univariate analysis does not show the positive effect of PE syndication. The positive effect may not be observed because we check the $OCI_{adjusted}$ for the level of share retention only in the multivariate regression.

Robustness Check and the Stepwise Regression Model
As a first robustness check, we use the stepwise procedure to ensure that the OLS regression does not include any variables with low or non-existent explanatory power. Compared to the models described above, we use the D_SPE to test the certification hypothesis and we include the lockup duration as a possible determinant of underpricing, OCI and $OCI_{adjusted}$, and the level of gross spreads as a factor to predict underpricing and OCI. Aggarwal *et al.* (2002) introduce a model in which the managers strategically underprice the IPO to maximise their wealth from selling shares at lockup expiration. Mohan and Chen (2001) test whether or not the lockup period provides information regarding ex-ante uncertainty about the IPO value. They argue that risky IPOs are associated with a longer lockup period because investors need more time to resolve uncertainty. Similarly, for Brav and Gompers (2003) the firms with greater potential for moral hazard usually use longer lockup periods. With reference to gross spreads, as discussed above, some researchers have demonstrated the existence of a trade-off between underpricing and gross spread (Habib and Ljungqvist, 2001; Chahine, 2004). Moreover, the relationship between PE backing and gross spread is ambiguous [Megginson and Weiss, 1991; Lee and Wahal, 2004; Dolvin, 2005; Zhang, 2007].
Table 7 presents the main results.

[Insert table 7 about here]

It should be noted that the use of stepwise regression identified the same determinants as those described above (Columns 1, 5 and 7), such as the effects of PE backing, which remain substantially unchanged (the coefficient decreases from -0.054 to -0.051 for underpricing, from -0.023 to -0.017 from OCI and from -0.019 to -0.017 for $OCI_{adjusted}$). Neither gross spreads nor the duration of the lockup provisions significantly affect the dependent variables.
As a second robustness test, we calculate the beta, which is required for adjusted underpricing, using three-month daily returns. Examining the results in Column 3, the coefficients of the control variables and of the syndicated PE backing are mainly in line with those presented in Column 1. Moreover, we measure the most significant explanatory variable, stock price volatility after the IPO, using the daily returns in the first month after the day of listing (Columns 2, 4, 6, and 8). Underpricing appears to be positively related to market trends, and the institutional oversubscription rate appears to affect underpricing more than the retail oversubscription rate. The retail and institutional subscription rates are probably significantly correlated, and this relationship may explain why the stepwise regression selects only one at a time. The selected subscription rate depends on the relationships with other variables. For example, the pre-IPO market trend, which is related to retail demand for IPO shares, might reduce the explanatory power of the retail

subscription rate compared to the institutional rate. The coefficient of the syndicated PE dummy increases from -0.051 (Column 1) to -0.059 (Column 2) and from -0.049 (Column 3) to -0.057 (Column 4). For the OCI and $OCI_{adjusted}$ we do not observe substantial changes in the findings.
One possible limitation of this study is that the results are partially generated by endogeneity in PE-backing, which we have not been able to address due to the small sample size and restrictions of our data set. This risk depends largely on the non-random distribution and characteristics of the IPOs of PE-backed firms (Lee and Wahal, 2004). Given that the major sectoral differences between PE-backed IPOs and non-PE backed IPOs in our sample are related to the different weight of utility firms (as shown in Table 2), we focus only on an analysis of industrial IPOs as a final robustness check. The findings, which are not reported, are consistent with those recorded for the full sample.

5. Conclusion

This study investigates the role of PE investors in the underpricing and wealth loss of pre-existing shareholders in Italian IPOs. The presence of institutional investors in the ownership structure of U.S. firms going public has been associated with lower first-day initial returns and the cost of listing. The phenomenon in Europe is difficult to interpret because there is a diversity of operators with different governance structures, strategies and purposes. In Italy, we are the first to inform the debate about two issues.
First, we test the validity of the certification hypothesis, focusing on the differences between single and syndicated PE investors and between bank-based and non-bank-based PE investors. Second, we analyse whether the PE certification role reduces the wealth loss of pre-existing shareholders by taking the degree of gross spreads into consideration. Using a sample of firms going public on the Milan Stock Exchange from January 1998 to June 2008, we find that SPE-backed firms are only associated with lower first-day returns (-1.48% using mean simple underpricing and -0.86% using mean beta-adjusted underpricing) compared to both NSPE (4.03% using mean simple underpricing and 4.01% using mean beta-adjusted underpricing) and non-PE-backed firms, while no significant difference in underpricing between bank-related and non-bank-related PE-backed IPOs is observed. These results have been verified in terms of market-sentiment variables, the underlying firm and issue characteristics through a multivariate regression model. We find that among the "market-sentiment variables" (Market Index and Market Volatility) only the pre-IPO market trend can help explain underpricing, and that "IPO-specific" variables are not statistically significant. Additionally, there is strong evidence indicating that higher ex-ante uncertainty about the value of a company going public is associated with greater underpricing. Lastly, share rationing (demand greater than supply), which is used as a proxy for demand, has a positive influence on underpricing. With reference to variables of specific interest for this paper, we find from a univariate analysis that only PE syndications create certification value. Tian (2009) suggested that the presence of multiple PE investors might communicate favourable private information to capital markets containing asymmetric information problems. We argue that PE-syndicated backing reduces underpricing because it is a good proxy for the quality of PE investors.
A simple classification such as bank-related versus non-bank-related PE investors does not contribute to the discussion. The relationship between the presence of a bank-related PE investor and underpricing likely depends on the type of pre-IPO investment (bridge financing or expansion and development capital). However, we find that bank-related PE investors that lead a PE syndication (typically in high risk/return investment projects) have a larger impact on these issues, whereas the simple presence in a firm, on an individual basis, of bank-related PE investors (typically in bridge financing operations) does not provide certification effects.
The second question we address is whether the PE certification role affects the wealth loss of pre-existing shareholders and whether the determinants of underpricing are able to explain this variable. Following Dolvin and Jordan's (2008) approach, we measure the OCI, capturing both the effect of underpricing on secondary shares sold and the cost of dilution associated with the primary shares

issued. Once again, we find that syndicated PE investors are able to significantly contain the cost of going public for the issuer. This positive effect persists even when we measure the OCI net of the gross spread, despite the greater spread charged in syndicated PE-backed IPOs.
Finally, our analyses demonstrates that the main variables that are useful for explaining underpricing, such as risk proxy variables, also affect the OCI.
This paper has interesting implications. Italian investors can use our model to predict underpricing and decide whether to underwrite the IPO, while the managers of Italian firms can obtain some indication as to how to go public with lower costs. In addition, policymakers and market management companies can look at this study with interest because the PE certification effect plays an important role in facilitating the workings of the capital markets. This issue is very important because underdevelopment of the market for risk capital is a weakness for the Italian economy and a limit for profitability of the market management company.

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Appendix

Table 1. An overview of the study on PE-backed IPOs.

Authors	Market	Time series	PE-backed Underpricing	NPE-backed Underpricing	Difference in means: t test*
Barry *et al.* (1990)	U.S.	1978-1987	7.47%	8.43%	-
Megginson and Weiss (1991)	U.S.	1983-1987	7.10%	11.90%	-3.62*
Francis and Hasan (2001)	U.S.	1990-1993	17,98%	15.07%	3.00**
Lee and Wahal (2004)	U.S.	1980-2000	26.80%	19.40%	7.45%*
		1980-1989	7.89%	8.50%	-0.61%***
		1990-1998	16.17%	16.70%	-0.53%***
		1999	88.93%	42.02%	46.90%*
		2000	67.89%	35.70%	32.19%**
Da Silva Rosa *et al.* (2006)	Australia	1991-1999	33.07%	24.09%	8.98%
Schertler (2002)	France	1997-2000	16.00%	9.20%	7.20%
Schertler (2002)	Germany	1997-2000	52.00%	49.30%	2.30%
Franzke (2003)	Germany	1997-2002	52.44%	48.38%	4.06%
Hamao *et al.* (2000)	Japan	1989-1994	19,2%	12,7%	6.50%***
Levis (2007)	U.K.	1992-2003	15.00%	22.40%	-
Coakley *et al.* (2009)	U.K.	1985-1997	8.90%	9.70%	-
		1998-2000	18.80%	15.40%	

* Studies not showing the difference in means did not carry out significance tests . *, **, ***, represent 1%, 5% and 10% significance levels, respectively.

Table 2. Sample IPO distribution by firm business sector.

Business Sector	Total	NPE-backed firms	PE-backed firms	SPE-backed firms	NSPE-backed firms	BPE-backed firms	NBPE-backed firms
Industrial Sector	*82*	*43*	*39*	*16*	*23*	*25*	*14*
Foodstuffs	7	2	5	1	4	4	1
Vehicles	5	2	3	1	2	2	1
Chemicals	15	7	8	5	3	2	6
Electronics and electro-mechanical	17	10	7	2	5	6	1
Mechanics	13	7	6	4	2	4	2
Textile and clothes	13	7	6	1	5	3	3
Building	3	1	2	1	1	2	0
Others	9	7	2	1	1	2	0
Services Sector	*78*	*51*	*27*	*11*	*16*	*13*	*14*
Delivery	9	5	4	2	2	1	3
Media	14	8	6	3	3	2	4
Public utilities	17	15	2	0	2	1	1
Tourism and transport	10	5	5	1	4	4	1
Others	28	18	10	5	5	5	5
Total	*160*	*94*	*66*	*27*	*39*	*38*	*28*

Note: This table presents the subdivision of the business sector sample based on the classification adopted by the Milan Stock Exchange. NPE-backed firms are not backed by PE investors, and PE-backed firms are backed by at least one PE investor. We classified the PE-backed firms according to two criteria: in SPE-backed and NSPE-backed firms, whether or not the firms are backed by a PE syndication or by an individual investor; and in BPE-backed and NBPE-backed firms, whether or not the firms are backed by bank-related or non-bank-related PE investors.

Table 3. IPO timeline.

	IPOs	PE-backed IPOs		SPE-backed IPOs		BPE-backed IPOs	
Year	**Total number**	**Number**	**(%)**	**Number**	**(%)**	**Number**	**(%)**
1998	11	6	54.55%	1	9.09%	3	27.27%
1999	23	10	39.13%	5	21.74%	5	21.74%
2000	39	15	41.03%	7	17.95%	8	20.51%
2001	18	4	22.22%	2	11.11%	4	22.22%
2002	4	1	25.00%	1	25.00%	1	25.00%
2003	4	2	50.00%	1	25.00%	1	25.00%
2004	7	4	57.14%	1	14.29%	2	28.57%
2005	9	5	55.56%	2	22.22%	5	55.56%
2006	20	10	50.00%	2	10.00%	4	20.00%
2007	22	8	36.36%	4	18.18%	5	22.73%
2008	3	1	33.33%	1	33.33%	0	0.00%
1998-2008	160	66	41.25%	27	16.88%	38	23.75%

Notes: This table presents the IPO timeline in our sample. PE-backed firms are backed at IPO time by at least one PE investor; SPE-backed firms are backed by a PE syndication; BPE-backed firms are backed by bank-related PE investors.

Table 4. Descriptive sample statistics.

	NPE-backing (1)	PE-backing (2)	(1) vs. (2)	NSPE-backing (3)	SPE-backing (4)	(3) vs. (4)	NBPE-backing (5)	BPE-backing (6)	(5) vs. (6)
Panel A - Issuer Characteristics:									
Total Assets (€ ml)	227.04	185.79	41.25	201.12	165.34	-35.78	159.50	204.26	-44.76*
	(162.01)	(161.47)	(0.54)	(162.33)	(161.48)	(-0.85)	(159.58)	(163.12)	(-3.54)
Age (years)	3.26	3.50	-0,24	3.65	3.29	-0.36	3.28	3.65	-0.37
	(3.15)	(3.33)	(-0,18)	(3.47)	(3.05)	(-0.42)	(3.23)	(3.33)	(-0.10)
Panel B - Offering Characteristics:									
IPO Size (€ ml)	384.08	126.13	257,95	152.30	91.22	-61.08	97.34	146.35	-49.01
	(80.08)	(56.20)	(23.88)	(52.27)	(59.77)	(7.50)	(57.99)	(51.98)	(6.01)
Share Retention	69.51	62.59	6.92***	64.61	59.91	4.70*	63.58	61.9	1.68
	(70.00)	(65.15)	(4.85)***	(66.97)	(60.04)	(6.93)*	(63.96)	(64.15)	(-0.19)
Sell (percent)	32.07	40.89	-8.82*	41.43	40.18	-1.35	40.38	38.10	2.28
	(20.00)	(33.96)	(-13.96)**	(39.71)	(33.33)	(-6.38)	(36.04)	(35.85)	(0.19)
Lockup (months)	11.71	11.12	0.58	10.55	11.81	1.26	10.7	11.41	-0.71
	(12.00)	(12.00)	(0.00)	(12.00)	(12.00)	(0.00)	(12.00)	(12.00)	(0.00)
Retail Oversub	5.89	4.81	1,08	5.54	3.84	-1.70	6.48	3.64	2.84*
	(3.56)	(2.25)	(1.31)	(2.07)	(2.90)	(0.83)	(3.99)	(1.62)	(2.37)**
Institutional Oversub	5.89	3.83	2.06*	4.30	3.21	-1.09	5.14	2.91	2.23*
	(2.72)	(2.24)	(0.48)	(2.22)	(2.24)	(0.02)	(3.23)	(1.97)	(1.26)

(*continued*)

Table 4. *(Continued).*

	NPE-backing (1)	PE-backing (2)	(1) vs. (2)	NSPE-backing (3)	SPE-backing (4)	(3) vs. (4)	NBPE-backing (5)	BPE-backing (6)	(5) vs. (6)
Panel C – After-market and costs of listing									
$SD_{4\text{-days}}$ (percent)	2.92	2.53	0.39	2.57	2.48	-0.09	2.38	2.63	-0.30
	(2.09)	(1.37)	(0.72)	(1.30)	(1.39)	(0.09)	(1.41)	(1.35)	(0.10)
Simple Underpricing (percent)	6.21	1.67	4.54***	4.03	-1.48	-5.55**	2.80	0.87	1.93
	(1.48)	(0.00)	(1.48)***	(0.65)	(-1.21)	(-1.86)**	(0.53)	(-0.44)	(0.97)
Beta Adjusted Under-pricing (percent)	6.57	1.92	4.65***	4.01	-0.86	-4.87**	2.81	1.30	1.51
	(2.24)	(0.05)	(2.19)***	(0.74)	(-0.46)	(-1.20)	(1.09)	(0.25)	(0.84)
Gross Spread (percent)	3.74	4.15	-0.40**	4.00	4.33	0.33	4.20	4.11	0.09
	(4.00)	(4.25)	(-0.25**)	(4.13)	(4.25)	(0.12)	(4.13)	(4.34)	(-0.21)
OCI (percent)	1.72	0.29	1.43**	1.11	-0.81	-1.92*	0.80	-0.07	0.87
	(0.58)	(0.00)	(0.58)***	(0.32)	(-0.52)	-0.80*	(0.20)	(-0.15)	(0.35)
$OCI_{adjusted}$ (percent)	2.94	2.15	0.80	2.84	1.31	-1.53	2.10	2.18	-0.08
	(2.24)	(1.66)	(0.58)	(2.27)	(1.56)	(-0.71)	(2.39)	(1.62)	(0.77)

Notes: This table presents the means (with medians in parentheses) for the variables relating to some characteristics of the issuers (Panel A), their offerings (Panel B), underpricing (simple and beta-adjusted), other costs of listing and the after-market SD of stock returns (Panel C). Data analysis without removing outliers can lead to false results and provide misleading information. According to the asymmetrical trimming method of measuring mean underpricing, we removed the 5% of IPOs with the highest underpricing by cutting the right tail of the underpricing distribution (five non-PE-backed IPOs and three PE-backed IPOs). The test for mean difference is a standard t-test, allowing for unequal variance. The test for the difference in the medians is a Wilcoxon's rank-sum test. *, **, and *** asterisks indicate 10%, 5%, and 1% significance, respectively.

Table 5. IPO mean beta adjusted underpricing and $OCI_{adjusted}$ by listing year.

	IPOs		NPE backing IPOs		PE-backed IPOs		Difference	NSPE-backed IPOs		SPE-backed IPOs		Difference
	n.	Underpricing (x)	n.	Underpricing (y)	n.	Underpricing (z)	(y-z)	n.	Underpricing (w)	n.	Underpricing (s)	(w-s)
1998	10	2.93%[a]	4	9.31%	6	-1.32%	10.63%**	5	-0.32%	1	-6.28%	5.96%
1999	19	5.73%[b]	11	12.42%	8	-3.46%	15.88%***	3	-4.67%	5	-2.74%	- 1.93%
2000	36	5.63%**[c]	22	7.81%	14	0.66%	7.15%*	7	4.67%	7	-2.62%	7.15%*
2001	18	-0.53%	14	0.05%	4	-2.55%	2.60%	2	-3.07%	2	-0.53%	-2.54%
2002	4	1.55%**	3	1.24%	1	2.47%	-1.23%	0	-	1	2,47%	-
2003	4	-2.48%	2	-2.35%	2	-2.61%	0.26%	1	-0.62%	1	-4.60%	-3.98%
2004	7	4.58%	3	11.70%	4	-0.76%	12.46%**	3	0.76%	1	-5.31%	6.07%
2005	9	8.35%*	4	13.12%	5	4,53%	8.59%	3	8.24%	2	-1.61%	9.58%
2006	20	9.65%***	10	8.87%	10	10.43%	-1.56%	8	10.09%	2	11.80%	-1.56%
2007	22	3.90%***	14	3.74%	8	4.18%	-0.44%	4	6.56%	4	1.81%	4.75%
2008	3	-2.48%	2	-2.71%	1	-2,02%	-0.69%	0	-	1	-2.02%	-
1998-2008	152	4.65%***	89	6.57%	63	1.92%	5.44%***	36	4.01%	27	-0.86%	4.87%**

(*Continued*)

Table 5. (*Continued*).

	IPOs		NPE-backed IPOs		PE-backed IPOs		Difference	NSPE-backed IPOs		SPE-backed IPOs		Difference
	n.	$OCI_{adjusted}$ (x)	n.	$OCI_{adjusted}$ (y)	n.	$OCI_{adjusted}$ (z)	(y-z)	n.	$OCI_{adjusted}$ (w)	n.	$OCI_{adjusted}$ (s)	(w-s)
1998	10	-	4	-	6	-	-	-	-	-	-	-
1999	19	4.31%***[b]	11	6.96%	8	0.68%	6.28%***	3	-0.31%	5	1.30%	-1.61%*
2000	36	2.23%***[c]	22	2.77%	14	1.37%	1.41%	7	2.08%	7	0.65%	7,15%*
2001	18	0.97%	14	1.03%	4	0.75%	0.28%	2	0.65%	2	0.86%	-0.19%
2002	4	1.45%**	3	1.35%	1	1.76%	-0.41%	0	-	1	1.76%	-
2003	4	0.86%	2	-0.05%	2	1.77%	0,26%	1	3.00%	1	0.53%	0,26%
2004	7	1.38%	3	3.91%	4	-0.53%	4.44%**	3	-0.33%	1	-1.12%	-0.79%
2005	8	4.29%*	3	3.51%	5	4.76%	-1.25%	3	7.21%	2	0.49%	6.72%
2006	16	3.95%***	10	3.15%	8	4.75%	-1.60%	7	5.02%	1	2.91%	-1,56%
2007	20	2.65%***	12	2.38%	8	3.06%	-0.68%	4	2.92%	4	3.20%	-0.28%
2008	3	1.28%	2	1.43%	1	1.00%	0.43%	0	-	1	-1.00%	-
1998-2008	152	2.61%***	80	2.94%	55	2.15%	0.80%	30	2.84%	25	1.31%	1.53%

Notes: This table presents the means per year for beta-adjusted underpricing and OCI net of the gross spread. Data analysis without removing outliers can lead to false results and provide misleading information. Following the asymmetrical trimming method to measure mean values we removed the 5% of IPOs with the higher underpricing by cutting the right tail of the underpricing distribution (five non-PE-backed IPOs and three PE-backed IPOs). [a] We excluded Sabaf, [b] removed Finmatica, Gandalf, Italdesign, and Tiscali.[c] We excluded Chl, Tas, Acotel. *, **, and *** asterisks indicate t-test significance at 10%, 5%, and 1%, respectively. We focus only on SPE-backed firms because the previous univariate analysis does not show any significant difference between BPE and NBPE-backed IPOs.

Table 6. Results from Ordinary Least Square Regression (*Model 2* and *Model 3*).

Independent Variable	β-Adjusted $Underpricing_{1\text{-year}}$ (Column 1)		β-Adjusted $Underpricing_{1\text{-year}}$ (Column 2)		OCI (Column 3)		OCI (Column 4)		$OCI_{adjusted}$ (Column 5)		$OCI_{adjusted}$ (Column 6)	
	Coef.	t- stat	Coef.	t-stat	Coef.	t- stat	Coef.	t- stat	Coef.	t- stat	Coef.	t- stat
Constant	0.125	1.078	0.097	0.841	0.042	0.985	0.029	0.681	0.109	2.362	0.095	2.504
Log_Asset	-0.032	-2.130	-0.030	-1.955	-0.003	-0.470	-0.002	-0.286	-0.001	-0.128	0.000	-0.039
Log_Age	-0.003	-0.205	0.000	-0.028	-0.001	-0.222	0.000	0.024	-0.001	-0.162	0.000	0.073
Log_Size	0.003	0.153	0.003	0.146	-0.007	-0.890	-0.007	-0.885	-0.009	-0.982	-0.008	-0.942
Share Retention	0.000	0.002	0.025	0.277	-0.044	-1.342	-0.034	-1.032	-0.119	-3.556	-0.107	-3.227
Sell	-0.011	-0.400	-0.012	-0.429	-0.005	-0.491	-0.005	-0.528	-0.013	-1.222	-0.013	-1.218
Institutional Ratio	0.004	0.061	0.004	0.058	0.001	0.029	0.000	0.005	-0.009	-0.386	-0.007	-0.272
Market Index	1.406	0.156	4.099	0.457	-0.031	-0.009	-1.253	0.376	-3.345	-0.782	-2.422	-0.555
Market Volatility	-1.208	-0.839	-1.370	-0.840	-0.681	-1.282	-0.732	-1.357	-0.572	-1.038	-0.660	-1.177
$SD_{4\text{-days}}$	1.731	5.671	1.692	5.478	0.451	3.998	0.438	3.823	0.506	3.821	0.505	3.736
Log_Oversub Retail	0.056	1.616	0.059	1.682	0.031	2.427	0.032	2.466	0.030	2.174	0.031	2.242
Log_Oversub Inst	0.057	1.547	0.055	1.470	0.012	0.893	0.011	0.782	0.010	0.706	0.009	0.593

(*continued*)

Table 6. (*Continued*).

Independent Variable	β Adjusted Underpricing$_{1\text{-year}}$ (Column 1)		β Adjusted Underpricing$_{1\text{-year}}$ (Column 2)		OCI (Column 3)		OCI (Column 4)		OCI$_{adjusted}$ (Column 5)		OCI$_{adjusted}$ (Column 6)	
	Coef.	t- stat	Coef.	t-stat	Coef.	t- stat	Coef.	t- stat	Coef.	t- stat	Coef.	t- stat
D_Oversub	0.050	1.937	0.053	2.055	0.020	2.104	0.022	2.247	0.019	1.881	0.021	2.030
D_NM	-0.074	-3.262	-0.073	-3.206	-0.017	-2.084	-0.017	-2.010	-0.014	-1.572	-0.015	-1.617
D_EXP	0.014	0.498	0.013	0.447	0.001	0.056	0.000	0.014	0.007	0.623	0.006	0.523
D_SPE	-0.054	-2.431	-	-	-0.023	-2.850	-	-	-0.019	-2.255	-	-
D_NSPE	-0.016	-0.867	-	-	-0.007	-0.987	-	-	-0.002	-0.336	-	-
D_BPE	-	-	-0.028	-1.446	-	-	-0.014	-1.922	-	-	-0.010	-1.285
D_NBPE	-	-	-0.034	-1.565	-	-	-0.012	-1.519	-	-	-0.009	-1.080
Sample Size	146		146		146		146		130		130	
R^2	0.513		0.504		0.437		0.422		0.435		0.420	
Adjusted R^2	0.453		0.443		0.367		0.350		0.355		0.338	
Durbin-Watson	1.940		2.012		1.689		1.762		1.733		1.805	
F Statistic	8.506		8.201		6.246		5.887		5.433		5.166	

Notes: This table presents regression results explaining beta-adjusted underpricing and the OCI and OCI$_{adjusted}$ of the Milan Stock Exchange IPOs for the period from 1998 to 2008. The independent variables are: Log_Age, the log of the company age; Log_Asset, the log of the accounting value of the consolidated assets; Log_Size, the log of IPO proceeds; Share Retention, the fraction of equity capital held by the insiders after the IPO; Sell, the fraction of IPO shares sold by inside investors ('secondary shares'); Institutional Ratio, the percentage of the IPO allocated to institutional investors; Market Index, the market index return measured in the 100 days before listing; Market Volatility, the market index return volatility measured in the 60 days before listing; $SD_{4\text{-days}}$, the price volatility in the four days after listing; Log_Oversub Retail, the log of the ratio between the share demand and supply for retail investors; Log_Oversub Inst, the log of the ratio between the share demand and the supply for institutional investors; D_Oversub, a dummy variable taking a value of 1 when the oversubscription institutional segment is higher than the oversubscription retail segment; D_NM, a dummy set at1 when the IPO is preliminary to listing on the New Market; D_EXP, a dummy set at 1 when the company is listed on the Expandi Market; D_SPE, a dummy with a value of 1 for the companies backed by a PE syndication; D_NSPE, a dummy with a value of 1 for the companies backed by a single PE investor; D _BPE, a dummy with a value of 1 for the companies backed by a bank-affiliated PE investor; and D_NBPE, a dummy with a value of 1 for the companies backed by a non-bank-affiliated PE investor.

Table 7. Stepwise Regression Analyses.

Independent Variable	β-Adjusted $Underpricing_{1\text{-year}}$ (1) Coef.	β-Adjusted $Underpricing_{1\text{-year}}$ (2) Coef.	β-Adjusted $Underpricing_{3\text{-months}}$ (3) Coef.	β-Adjusted $Underpricing_{3\text{-months}}$ (4) Coef.	OCI (5) Coef.	OCI (6) Coef.	$OCI_{adjusetd}$ (7) Coef.	$OCI_{adjusted}$ (8) Coef.
Constant	0.090	0.173***	0.091	0.173***	-0.005	-0.019***	0.089***	0.053**
Log_Asset	-0.030***	-0.040***	-0.030***	-0.040***	-	-	-	-
Log_Age	-	-	-	-	-	-	-	-
Log_Size	-	-	-	-	-0.008	-	-0.011**	-
Share Retention	-	-	-	-	0.002	-	-0.097***	-0.072**
Sell	-	-	-	-	-	-	-0.011	-0.017*
Institutional Ratio	-	-	-	-	-	-	-	-
Gross Spread	-	-	-	-	-	-		
Lockup	-	-	-	-	-0.001	-	-0.001	-
Market Index	-	17.601**	-	18.884**	-	-	0.115	-
Market Volatility	-	-	-	-	-	-0.799	-	-0.741
$SD_{4\text{-days}}$ ($SD_{1\text{-month}}$)	1.874***	(1.689***)	1.878***	(1.701***)	0.521***	(0.559***)	0.484***	(0.565***)
Log_Oversub Retail	0.102***	-	0.101***	-	0.040***	0.037***	0.038***	0.032***
Log_Oversub Inst	-	0.095***	-	0.091***	-	-	-	-

(*Continued*)

Table 7. (*Continued*)

Independent Variable	β-Adjusted $Underpricing_{1\text{-year}}$ (1) Coef.	β-Adjusted $Underpricing_{1\text{-year}}$ (2) Coef.	β-Adjusted $Underpricing_{3\text{-months}}$ (3) Coef.	β-Adjusted $Underpricing_{3\text{-months}}$ (4) Coef.	OCI (5) Coef.	OCI (6) Coef.	$OCI_{adjusetd}$ (7) Coef.	$OCI_{adjusted}$ (8) Coef.
D_Oversub	0.078***	0.030**	0.079***	0.033**	0.026***	0.025***	0.024***	0.023***
D_NM	-0.077***	-0.067***	-0.076***	-0.066***	-0.015**	-0.014**	-0.011	-0.014*
D_EXP	-	-	-	-	-	-	-	-
D_SPE	-0.051***	-0.059***	-0.049***	-0.057***	-0.017**	-0.021**	-0.017**	-0.018**
Sample Size	147	151	147	151	137	147	131	131
P-value forwards/backwards	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
R^2	0.491	0.450	0.478	0.434	0.420	0.413	0.429	0.422
Adjusted R^2	0.469	0.423	0.455	0.406	0.389	0.387	0.386	0.384
Durbin-Watson	1.811	2.022	1.852	2.062	1.668	1.675	1.672	1.752
F Statistic	22.509	16.716	21.324	15.665	13.351	16.338	10.082	11.143

Notes: This table presents stepwise regression results for beta-adjusted underpricing, the OCI and $OCI_{adjusted}$ of the Milan Stock Exchange IPOs for the period from 1998 to 2008. The independent variables are: Log_Age, the log of the company's age; Log_Asset, the log of the accounting value of consolidated assets; Log_Size, the log of IPO proceeds; Share Retention, the fraction of equity capital held by the insiders after the IPO; Sell, the fraction of IPO shares sold by inside investors ('secondary shares'); Institutional Ratio, the percentage of the IPO allocated to institutional investors; Gross Spread, the fee, in percent, paid to the underwriting syndicate; Lockup, the lockup period in days; Market Index, the market index return measured over the 100 days before listing; Market Volatility, the market index return volatility measured over the 60 days before listing; $SD_{4\text{-days}}$, the price volatility in the 4 days after the listing; Log_Oversub Retail, the log of the ratio between the share demand and supply for retail investors; Log_Oversub Inst, the log of the ratio between the demand of share and the supply for the institutional investors; D_Oversub, a dummy variable taking the value of 1 when the oversubscription institutional segment is higher than the oversubscription retail segment; D_NM, a dummy set at 1 when the IPO is preliminary to listing on the New Market; D_EXP, a dummy set at1 when the company is listed on Expandi Market; and D_SPE, a dummy with the value of 1 for the companies backed by a PE syndication;. ***, ** and * represent 1%, 5% and 10% significance levels, respectively.

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